

Voith Turbo

VOITH

Workshop Manual DIWA.5

Version 10/2007

Table of contents

1	General notes	1
1.1	Safety notes	1
1.2	Symbols	6
2	Tools	8
2.1	Tool for loosening the cable plugs from the solenoid coils	8
2.2	Tool for inserting the cable plugs at the solenoid coils	9
2.3	Tool for loosening the cable plugs from the cable harness	10
2.4	Tool for inserting the cable plugs in the cable harness	10
2.5	Measuring cover	11
3	General	12
3.1	Suspension points	12
3.2	Cleaning	13
3.3	Sealing elements	13
3.4	Hose lines	14
3.5	Storage	14
4	Troubleshooting	15
5	Draining the transmission oil	23
6	Dismounting the transmission	26
7	Dismounting the hydrodamp	29

7.1	Dismounting the hydrodamp	29
7.2	Checking the oil level	30
7.3	Wear check at the hub	31
8	Disassembling the transmission into assemblies	32
8.1	Dismounting the heat exchanger	32
8.2	Removing the control block cover	34
8.3	Removing the Control Blocks	35
8.4	Dismounting the cable harness	37
8.5	Removing the speed sensors	39
8.6	Dismounting temperature sensors/oil level sensor	41
8.7	Dismounting the oil pan	44
9	Dismounting and mounting assemblies	47
9.1	Dismantle the solenoids	47
9.2	Installing the solenoids	48
10	Assembling the transmission	49
10.1	Mount the oil pan.	49
10.2	Mounting the cable harness	53
10.3	Mounting the control blocks	56
10.4	Mounting the control block cover	57
10.5	Mounting the heat exchanger	58
11	Installing the transmission	59
11.1	Mounting the hydrodamp	59
11.2	Install the transmission	60

12	Fill the transmission with oil.	63
13	Test drive	64
14	Measurement and Test	66
14.1	Measuring the stall point	66
14.2	Measuring pressures	68
15	Tightening torques	71

1 General notes

1.1 Safety notes

Operation, maintenance and repair of the transmission are always subject to the relevant local safety and accident prevention regulations.

These regulations can apply to, for example, the handling of hazardous materials, the provision and wearing of personal protective gear or motor vehicle regulations.

Anyone operating the transmission or any persons involved in the installation, repair or maintenance work have to familiarize themselves with the warning notes and precautions described in this document.

Anyone operating the transmission or any person involved in the installation, repair or maintenance of the transmission must exercise utmost diligence in making sure that his or her own personal safety or the safety of others is not in danger.

State of the art

This transmission is designed and constructed according to the state of the art in technology and acknowledged safety regulations. Nevertheless, operation, installation, repair and maintenance of the transmission can involve the risk of injury and death of persons or damage the transmission and other material assets if:

- the transmission is put to different use than prescribed,
- the transmission is operated, serviced or repaired by unqualified staff,
- the transmission is modified or reconstructed improperly and/or
- the safety notes are not observed.

Proper use

The proper use of the DIWA transmission is its application as an automatic drive for busses.

Any use other than the one described above is considered improper. Voith Turbo GmbH & Co. KG does not assume any liability for improper use. In this case, the risk lies solely with the user.

The persons in charge, in particular the staff engaged in operation and maintenance, must by all means heed the guidelines for the proper and correct use of the transmission.

Conditions for usage

The transmission may only be operated:

- in technically flawless condition,
- for its intended purpose,
- with respect to the safety instructions and the dangers involved and in compliance with the technical manual and other technical documents.

Malfunctions that impair the safety must be eliminated immediately.

Staff qualification

Work on the transmission may only be carried out by staff who have been properly trained, instructed and authorized by the operator. The legally prescribed minimum age must be observed.

Maintenance and repair work requires special knowledge and training (e.g., a Voith diagnostics and repair training course) and may only be carried out by accordingly qualified personnel.

Personnel who are currently being trained, instructed, trained on the job or undergoing a general training, may work on the transmission only under the permanent supervision of a person assigned to this purpose.

Responsibilities

The responsibilities of the personnel working on the transmission must be clearly defined and complied with.

Only personnel who are explicitly ordered, authorised and trained to do so are allowed to work on the transmission.

Work on the chassis, brakes or steering systems may only be carried out by accordingly qualified personnel.

Unsafe instructions

The personnel working on the transmission must refuse to comply with the unsafe instructions of third parties.

Hoisting devices

Use only appropriate and technically immaculate hoisting devices and load suspension devices with sufficient load capacity.

When replacing transmission, assemblies or individual parts, these must be carefully attached to hoisting devices and secured such that they do not present any risk.

Never stay or work under suspended loads.

Risk of burning

The oil can become very hot - in extreme cases up to 130°C.

Improper handling may cause burns to the skin.

Therefore, let the transmission cool down to approx. 60°C before changing the oil.

Risks of accidents caused by oil

Oil that escapes through lines, gaskets or O-rings which were not installed correctly or which have become leaky after prolonged time in operation, can cause accidents.

The oil can be highly pressurised in pipes and conduits as well as in the converter.

Shut off the drive motor before conducting maintenance work or repairs.

Spare parts

Use only original spare parts for repairs, since only they can guarantee that the transmission complies with the road safety regulations and the technical state on delivery.

When replacing parts, it is crucial to observe the notes in the spare parts catalogue.

Original spare parts are designed especially for the Voith transmission. We would like to point out that original spare parts which are not supplied by Voith are neither tested nor approved by Voith. The installation and/or use of non-original spare parts might affect the specified features of the transmission and thus impair safety.

In case of any damage due to the use of non-original spare parts, Voith does not assume any liability.

Work on the transmission

Prior to performing maintenance or inspection operations on the installed transmission and during installation and removal of the transmission, the engine of the bus must be secured against starting.

Prior to performing maintenance or inspection operations on the installed transmission and during installation and removal of the transmission, the bus must be secured in such a way that it cannot be put in motion, either deliberately or accidentally (slope!).

The prescribed service work must be carried out regularly, on time and with the intended fuels and fluids.

The work must be performed in accordance with Voith provisions, e.g. the customer service information that describes improvements and modifications to the transmission so that no parts and tools suffer damage.

Performing work on the transmission requires the appropriate workshop equipment.

After having worked on the transmission, all transmission oil lines must be checked for leaks, loose connections, chafing and damage. Any defects must be eliminated immediately.

After having worked on the transmission, all joints must be checked for leakage.

All screwed connections loosened during work on the transmission must be tightened to the tightening torques indicated in the technical documents on the transmission.

Cleaning the transmission

Before cleaning the transmission with water or steam jet (high-pressure cleaner) or other cleaning agents, any openings into which no water, steam or cleaning agent must penetrate for reasons of safety and functioning must be sealed.

Oil hose lines lying outside must not be directly exposed to the jet of the high-pressure cleaner.

After cleaning, remove all covers/adhesives completely.

Conversion or modification of the transmission

Any modifications, attachments or conversions of the transmission must not be implemented without approval from Voith Turbo GmbH & Co. KG.

Disposal

Fluids and auxiliary substances (e.g. used oil) and disassembled parts must be disposed of in a safe and environmentally sound manner.

The local regulations and laws on environmental protection and disposal of hazardous materials must be observed.

Towing

Shift the transmission to idle gear (N key).

Unplug the connecting cable between control and transmission from the control unit.

If the transmission is damaged: Dismount the cardan shaft or stub shaft of the rear axle.

If no transmission damage is detected, the vehicle can also be towed with the cardan shaft:

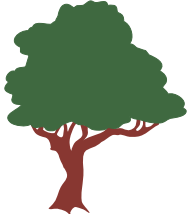
- max. permissible distance: 10 km
- max. permissible speed: 30 km/h.

For transmissions with angle drives it is in any case necessary to remove the cardan shaft or stub shaft of the rear axle.

If this is not possible, please contact the Voith customer service.

1.2 Symbols

	 DANGER DANGER indicates imminent danger to life and health of people. Non-compliance with this note results in serious damage to your health as well as life-threatening injuries.
	 WARNING WARNING indicates possible danger to life and health of people. Non-compliance with this note may result in serious damage to your health as well as life-threatening injuries.
	 CAUTION CAUTION indicates a potentially dangerous situation. Non-compliance with this note may result in minor injuries or damage to property.
	NOTE Note indicates information on the proper handling of the transmission. It does not indicate dangerous situations.

	ENVIRONMENT
	Environment indicates a potentially harmful situation for the environment owing to operation, maintenance or repair of the transmission.

- ➔ Meaning: an activity to be performed.
- ↩ Meaning: the result of an activity.
- Meaning: please note especially.

2 Tools

2.1 Tool for loosening the cable plugs from the solenoid coils

Order number H68.153510

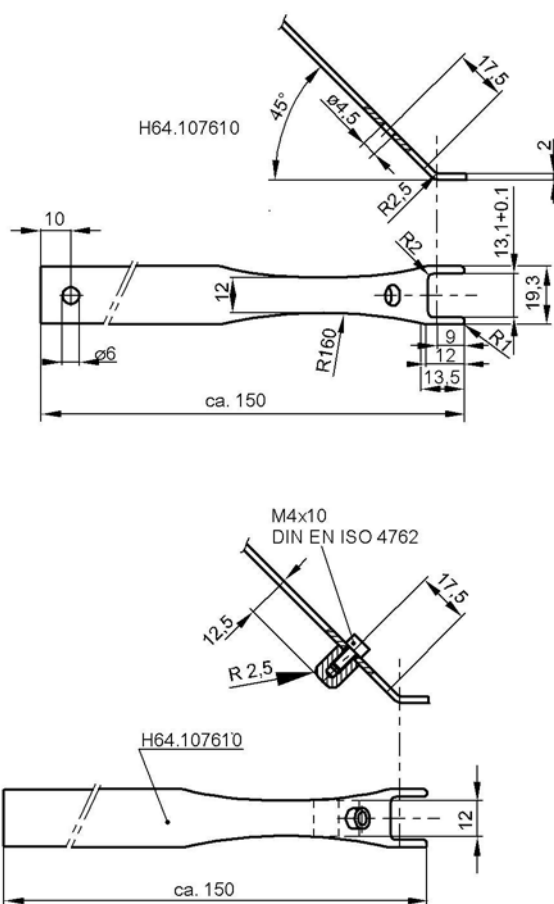


Fig. 1 Tool for loosening the cable plugs from the solenoid coils

2.2 Tool for inserting the cable plugs at the solenoid coils

Order number 150.00014510

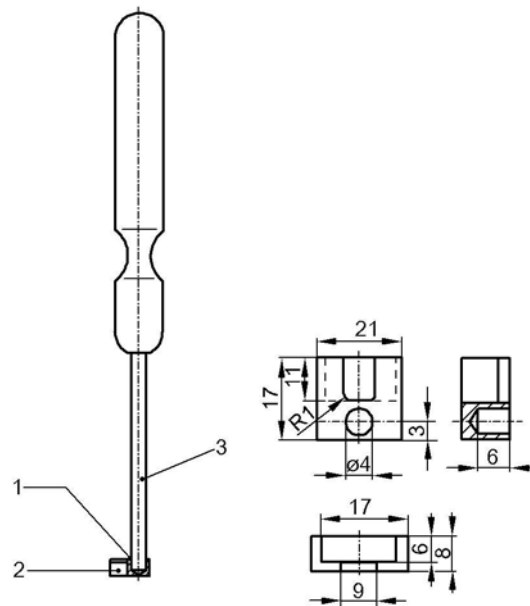


Fig. 2 Tool for inserting the cable plugs at the solenoid coils

- 1 – soldered
- 2 – 150.00014410
- 3 – screwdriver DIN 5265-C-A 0, 8x4, tip removed

2.3 Tool for loosening the cable plugs from the cable harness

Order number H68.153410

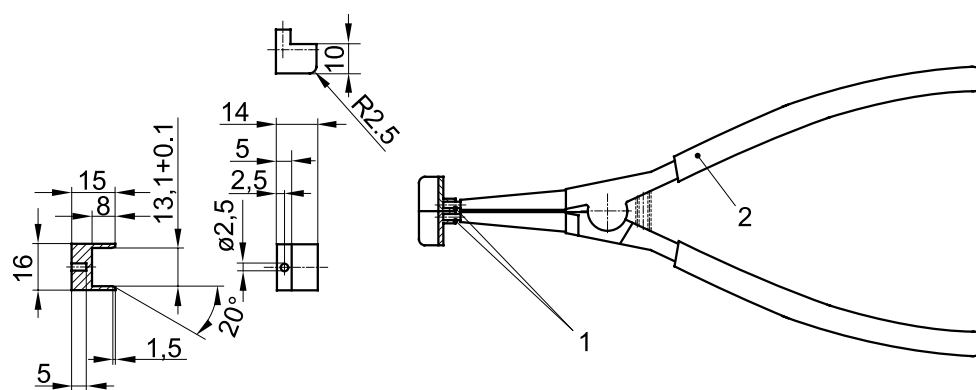


Fig. 3 Tool for loosening the cable plugs for the temperature sensor from the cable harness

- 1 – soldered
- 2 - pliers DIN 5254-A40-gl

2.4 Tool for inserting the cable plugs in the cable harness

Order number H68.153310

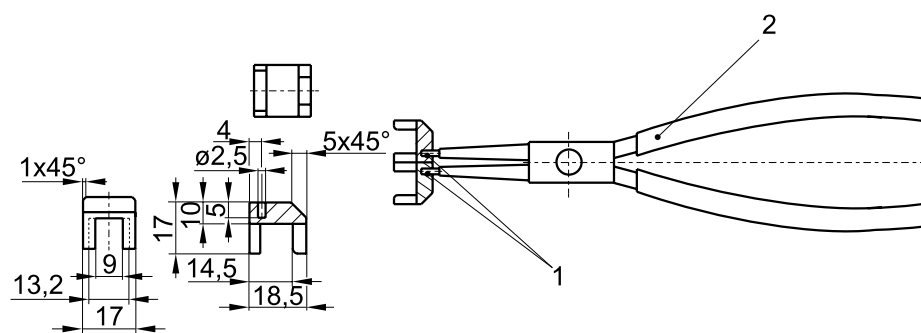


Fig. 4 Tool for inserting the cable plugs for the temperature sensor at the cable harness

- 1 – soldered
- 2 - pliers DIN 5256-C40-gl

2.5 Measuring cover

Order number H64.215710

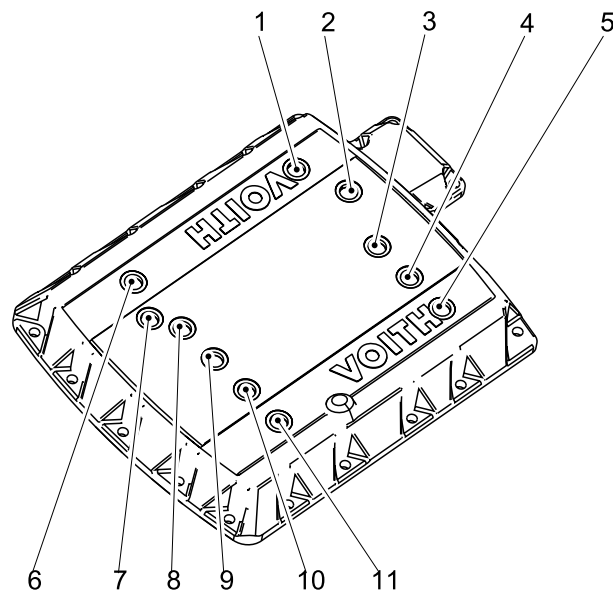


Fig. 5 Measuring cover

1	WR	7	Operating pressure
2	Converter pressure	8	DK
3	TB	9	EK
4	RG	10	PB
5	RK	11	WP
6	SK		

Test adapter

Order number H-50.880210

☐ Quantity 9

Sealing ring

Order number H50.010711

☐ Quantity 9

3 General

3.1 Suspension points

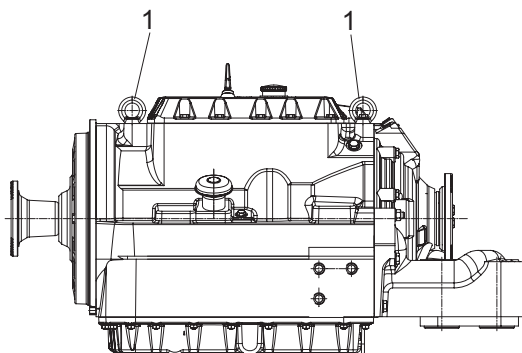


Fig. 6

- ➔ Use only the suspension points (eyebolts M12, 1) to attach the transmission to an appropriate lifting device [⇒ Page 3] that assures an even weight distribution.

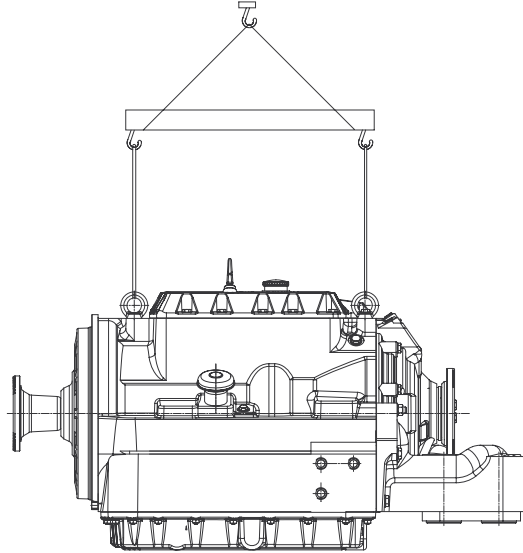


Fig. 7

- ➔ The eyebolts may only be subjected to vertical upward stress.
- ❑ The maximum weight allowed to be attached to the eyebolts is the transmission with heat exchanger and angle drive.
- ❑ It is not permitted to lift any additional loads at the eyebolts.

3.2 Cleaning

If the transmission is very dirty, clean [⇒ Page 4] it before repair.

After disassembly, clean all parts.

3.3 Sealing elements

Replace all sealing elements that were removed.

Install all flat gaskets without using grease.

3.4 Hose lines

Even if they are stored properly and not stressed beyond the allowed limits, hoses and hose lines are subject to a natural ageing process. Their service life is therefore limited.

DIN 20066 recommends: The service life of a hose line including storage must not exceed 6 years.

3.5 Storage

If a transmission is stored after repair without a test run, it has to be protected against corrosion during storage.

4 Troubleshooting

Faults	Possible causes	Elimination
Vehicle does not start although: - a gear is engaged, - the parking brake is released, - the accelerator pedal is applied. Note: When stationary, the vehicle revs up to maximum speed.	The EK solenoid coil is defective.	Check [⇒ Page 66] the oil pressure at the EK port in the test cover. Check the EK solenoid coil and replace it when found to be defective.
	The EK solenoid valve is defective.	Please contact the Voith customer service.
	The input clutch (EK) solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the EK solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the EK port in the test cover. Please contact the Voith customer service.
	The EK disks are damaged.	Please contact the Voith customer service.
	The operating pressure is too low.	Check the operating pressure and adjust [⇒ Page 66] it if necessary.
The vehicle does not drive in reverse although: - the reverse gear is engaged, - the parking brake is released, - the accelerator pedal is applied. Note: No problem when starting forward	The WP, RBG, RBK or WR solenoid coil is defective.	Check [⇒ Page 66] the oil pressure at the WP, RG, RK and WR port in the measuring cover. Check the WP, RBG, RBK or WR solenoid coils and replace [⇒ Page 47] them if they are defective.
	The WP, RBG, RBK or WR solenoid valve is defective.	Please contact the Voith customer service.

Faults	Possible causes	Elimination
	The WP, RBG, RBK or WR solenoid valve is sluggish or jammed because of dirt.	Please contact the Voith customer service.
	The lines to the WP, RBG, RBK or WR solenoid valve are dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the WP, RG, RK and WR port in the measuring cover. Please contact the Voith customer service.
	The converter inlet or outlet valve is sluggish or jammed. The ventilation valve is sluggish or jammed.	Please contact the Voith customer service.
	The RB disks are damaged.	Please contact the Voith customer service.
	The converter is leaky.	Please contact the Voith customer service.
	The operating pressure is too low.	Check the operating pressure and adjust [⇒ Page 66] it if necessary.
Shifting jerk when engaging a gear.	The EK solenoid coil is defective.	Check [⇒ Page 66] the oil pressure at the EK port in the test cover. Check the EK solenoid coil and replace [⇒ Page 47] it when found to be defective.
	The input clutch (EK) solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the EK solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the EK port in the test cover. Please contact the Voith customer service.
	The EK disks are damaged.	Please contact the Voith customer service.

Faults	Possible causes	Elimination
The acceleration in all gears is too low.	The engine output is insufficient.	Contact vehicle manufacturer or Voith.
Poor acceleration in first gear	The TB or WR solenoid coil is defective.	Check [⇒ Page 66] the oil pressure at the TB and WR port in the test cover. Check the TB and WR solenoid coil and replace [⇒ Page 47] when found to be defective.
	The TB or WR solenoid valve is defective.	Please contact the Voith customer service.
	The TB or WR solenoid valve is sluggish or jammed because of dirt.	Please contact the Voith customer service.
	The tubing to the TB or WR solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the TB and WR port in the test cover. Please contact the Voith customer service.
	The TB disks are damaged.	Please contact the Voith customer service.
	The operating pressure is too low.	Check the operating pressure and adjust [⇒ Page 66] it if necessary.
Vehicle drives in 1st gear only.	Button 1 is applied at the gear range selector.	Press button D.
	The PB solenoid coil is defective.	Check [⇒ Page 66] the oil pressure at the PB port in the test cover. Check the PB solenoid coil and replace [⇒ Page 47] it when found to be defective.
	The PB solenoid valve is defective.	Please contact the Voith customer service.
	The PB solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.

Faults	Possible causes	Elimination
	The tubing to the PB solenoid valve is dirty or interrupted.	Check the oil pressure at the PB port in the test cover. Please contact the Voith customer service.
	The PB disks are damaged.	Please contact the Voith customer service.
	The operating pressure is too low.	Check the operating pressure and adjust [⇒ Page 66] it if necessary.
No pull in second gear	The PB solenoid valve is defective.	Please contact the Voith customer service.
	The PB solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the PB solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the PB port in the test cover. Please contact the Voith customer service.
	The PB disks are damaged.	Please contact the Voith customer service.
Vehicle drives in first and second gear only.	Button 2 is applied at the gear range selector.	Press button D.
	The DK solenoid coil is defective.	Check [⇒ Page 66] the oil pressure at the DK port in the test cover. Check the DK solenoid coil and replace [⇒ Page 47] it when defective.
	The DK solenoid valve is defective.	Please contact the Voith customer service.
	The DK solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.

Faults	Possible causes	Elimination
	The tubing to the DK solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the DK port in the test cover. Please contact the Voith customer service.
	The DK disks are damaged.	Please contact the Voith customer service.
No pull in third gear	The DK solenoid valve is defective.	Please contact the Voith customer service.
	The DK solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the DK solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the DK port in the test cover. Please contact the Voith customer service.
	The DK disks are damaged.	Please contact the Voith customer service.
Vehicle drives in first, second and third gear only.	Button 3 is applied at the gear range selector.	Press button D.
	The SK solenoid coil is defective.	Check [⇒ Page 66] the oil pressure at the SK port in the test cover. Check the SK solenoid coil and replace [⇒ Page 47] it when defective.
	The SK solenoid valve is defective.	Please contact the Voith customer service.
	The SK solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the SK solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the SK port in the test cover. Please contact the Voith customer service.

Faults	Possible causes	Elimination
	The SK disks are damaged.	Please contact the Voith customer service.
No pull in fourth gear	The SK solenoid valve is defective.	Please contact the Voith customer service.
	The SK solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the SK solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the SK port in the test cover. Please contact the Voith customer service.
	The SK disks are damaged.	Please contact the Voith customer service.
Engine stalls in reverse gear	The converter outlet valve is sluggish or jammed.	Please contact the Voith customer service.
	The WP solenoid valve is defective.	Please contact the Voith customer service.
	The WP solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the WP solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the SK port in the test cover. Please contact the Voith customer service.
No retarder operation	The PB, WP, RBG, RBK or TB solenoid valve is defective.	Please contact the Voith customer service.
	The PB, WP, RBG, RBK or TB solenoid valve is sluggish or jammed because of dirt.	Please contact the Voith customer service.
	The lines to the PB, WP, RBG, RBK or TB solenoid valve are dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the PB, WP, BG, RK and TB port in the test cover. Please contact the Voith customer service.

Faults	Possible causes	Elimination
	The RB or TB disks are damaged.	Please contact the Voith customer service.
Hard retarder activation in first, second and third gear.	The WP, RBG or RBK solenoid valve is defective.	Please contact the Voith customer service.
	The WP, RBG or RBK solenoid valve is sluggish or jammed because of dirt.	Please contact the Voith customer service.
	The lines to the WP, RBG or RBK solenoid valve are dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the WP, RG or RK port in the test cover. Please contact the Voith customer service.
	The converter inlet or outlet valve is sluggish or jammed. The ventilation valve is sluggish or jammed.	Please contact the Voith customer service.
	The RB disks are damaged.	Please contact the Voith customer service.
Braking force in 2nd, 3rd and 4th gear too high	The converter outlet valve is sluggish or jammed.	Please contact the Voith customer service.
Braking force too low	The WR solenoid valve is defective.	Please contact the Voith customer service.
	The WR solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the WR solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the WR port in the test cover. Please contact the Voith customer service.
	The converter inlet or outlet valve is sluggish or jammed.	Please contact the Voith customer service.
	The converter is leaky.	Please contact the Voith customer service.

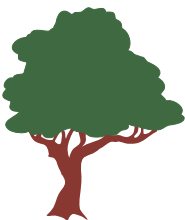
Faults	Possible causes	Elimination
Braking force in first gear too low or too high	RBK solenoid valve defective	Please contact the Voith customer service.
	The RBK solenoid valve is sluggish or jammed due to dirt.	Please contact the Voith customer service.
	The tubing to the RBK solenoid valve is dirty or interrupted.	Check [⇒ Page 66] the oil pressure at the RBK port in the test cover. Please contact the Voith customer service.
	The RB disks are damaged.	Please contact the Voith customer service.

5 Draining the transmission oil

- ➔ Shut off engine.
- ➔ Check the transmission oil temperature.

	NOTE Conditions Drain the oil at operating temperature only (at least 60°C). Otherwise, too much oil will remain in the transmission. The cooling water temperature indicator in the vehicle can be used to determine the transmission oil temperature since transmission oil and cooling water temperature are almost identical. ➔ If the transmission oil temperature is below 60°C, warm up the engine to operating temperature.
---	---

	WARNING Risk of scalding through hot oil Direct contact of the hot transmission oil with the skin can cause severe scalding injuries. ➔ Take appropriate safety precautions for handling hot oil.
---	--

	ENVIRONMENT Environmental hazard due to oil The used oil must not enter the environment. ➔ Collect the oil in an appropriate container. ➔ Any oil must be disposed of in accordance with the local regulations.
---	---

Draining oil from the oil sump



Fig. 8 Oil pan drain plug

- ➔ Loosen and remove the drain plug at the oil sump (1).
- ❑ Use an hexagon socket wrench size 12.
- ➔ Drain the oil.

Draining oil from the converter

- ❑ The drain plug at the converter (2) is accessible through the oil drain hole of the oil sump (1)..



Fig. 9 Converter drain plug

- ➔ Loosen and remove the drain plug for the oil in the converter (2).
- ➔ Use an hexagon socket wrench size 12.
- ➔ Drain the oil.

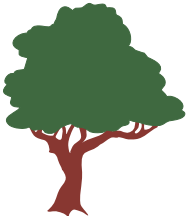
Closing the oil drain plugs

- ➔ Screw in the converter drain plug (2) with a new copper sealing ring 14x20.
- ➔ Pull tight the drain plug.
- ❑ Tightening torque 38 Nm.
- ➔ Screw in the drain plug of the oil sump (1) with a new copper sealing ring 26x34.
- ➔ Pull tight the drain plug.
- ❑ Tightening torque 100 Nm.

6 Dismounting the transmission

	 DANGER
	Risk of accident The vehicle can start to move accidentally and cause severe accidents. → Apply the parking brake. Secure the vehicle against rolling.

- Press N button at the gear range selector.
- Kill the engine.
- Turn ignition off.
- Unplug cable 1.

	ENVIRONMENT
	Environmental hazard due to coolant The used coolant must not enter the environment. → Collect the coolant in an appropriate vessel. → Any coolant must be disposed of in accordance with the local regulations.

- Drain the coolant.

	 WARNING
	Risk of scalding through hot oil Direct contact of the hot transmission oil with the skin can cause severe scalding injuries. → Take appropriate safety precautions when handling hot oil.

- Drain [⇒ Page 23] the transmission oil.

Dismounting the transmission using a crane

- ➔ Attach the transmission to a crane.

Dismounting the transmission using a hoisting device

- ➔ Secure the transmission against dropping from the hoisting device, e.g. using fastening straps.

	 CAUTION
	Damage of the flywheel housing When it is hot, the centering of the transmission flange to the flywheel housing is under increased compression due to the different expansion of the materials. ➔ If possible, do not dismount the transmission when it is hot. Should you nevertheless have to dismount it in hot condition, be extremely careful when detaching flywheel housing and transmission flange.

- ➔ Remove the screws between transmission flange and flywheel housing.
- ➔ Dismount the drive shaft.
- ➔ Dismount the coolant lines.
- ➔ Dismount all cables.

	 CAUTION
	Danger of damaging the hydrodamp It the transmission is lowered without being moved outward, the hydrodamp can be damaged. ➔ Before lowering the transmission, move it outward 8 cm parallel to the engine until the pinion shaft is free.

- ➔ Lower the transmission.

**NOTE****Oil loss at the hydrodamp**

A small amount of oil can leak out at internal sealing area of the hydrodamp.

An oil loss of max. 30 ml is allowed.

7 Dismounting the hydrodamp

7.1 Dismounting the hydrodamp

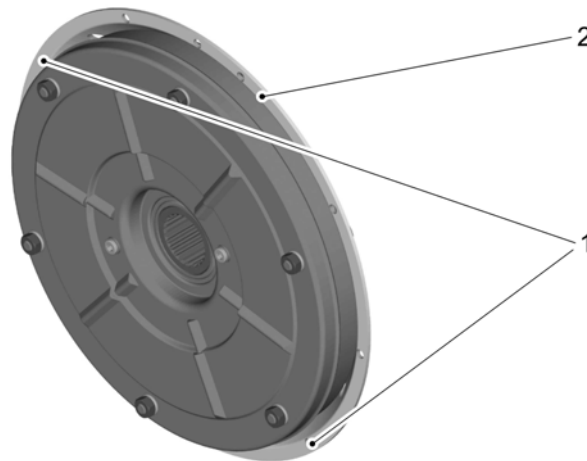


Fig. 10



CAUTION

Danger of damaging the hydrodamp

The hydrodamp is manufactured with tight tolerances on the inside. External damages can cause failure of the hydrodamp.

- ➔ Do not place the hydrodamp on its hub during transport, storage or exchange.
- ➔ Store or dispatch the hydrodamp in its original packing only.
- ➔ In case of repair, replace hydrodamp only as a whole.

- ➔ Unscrew two opposite screws M10 (1) out of the external pitch circle of the hydrodamp (2).
- ➔ Insert stud bolts, length 100 mm, into these places.
- ➔ Unscrew ten screws out of the external pitch circle (2).
- ❑ Do not remove the hex. head screws in the clutch.
- ➔ Press off the hydrodamp using the press-off screws.

- ❑ There may be an intermediate ring on the flywheel. This can become loose while removing. If this is the case, push the ring back to its position.

7.2 Checking the oil level

If oil traces are detected in the area of the hub, check the oil level in the hydrodamp.

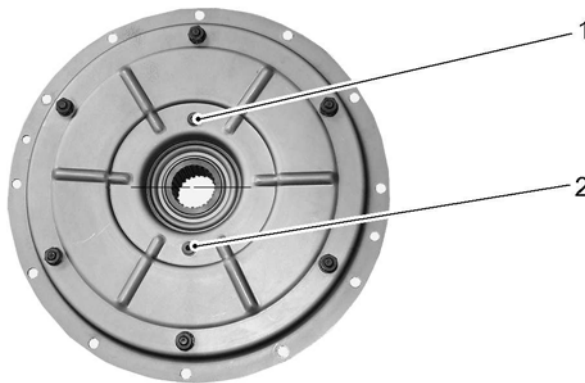
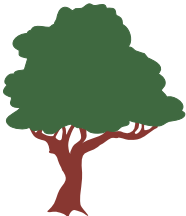


Fig. 11

	! WARNING
	Risk of burning through hot oil Hot oil can escape from the hydrodamp. This can cause burning. ➔ Make sure that the temperature in the hydrodamp is below 50°C. ➔ Wear personal protection gear when removing and working on the hydrodamp.
	ENVIRONMENT
	Environmental hazard due to escaping oil The oil from the hydrodamp must not enter the environment. Any oil that has escaped must be disposed of in accordance with the local regulations.

- ➔ Turn the hydrodamp so that the check bores (1) and (2) are perpendicular above each other.
- ➔ Wait for three minutes.

- ➔ Unscrew the upper screw plug (1).
- ➔ Turn the hydrodamp clockwise by 40° to 45° around the hub axis.

If oil escapes the bore while doing so:

The oil level is ok.

- ➔ Seal the bore (1) using a screw plug M10x1 and a new copper sealing ring 10.5x16x2 VGN3019 (special dimensions, no DIN design).
- ❑ Tightening torque 15 Nm.
- ➔ Screw in the screw plug with type 243 Loctite.

If no oil escapes the bore:

Oil does not reach the minimum oil level. This may be due to the hydrodamp having a leak.

- ➔ Replace the hydrodamp.

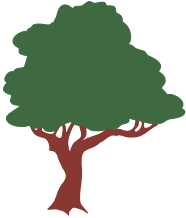
7.3 Wear check at the hub

To do so, check the backlash between the input shaft and hub of the hydrodamp.

- ➔ Plug the hydrodamp onto a new transmission input shaft.
- ❑ If the backlash at the bolt hole circle diameter of approx. 410 mm is greater than 2mm, replace the entire hydrodamp.

8 Disassembling the transmission into assemblies

8.1 Dismounting the heat exchanger

	 WARNING Risk of burning through hot oil There might be hot oil left in the heat exchanger. This oil might flow out when removing the heat exchanger. This can cause burning. ➔ Wear personal protection gear when removing the heat exchanger.
	ENVIRONMENT Environmental hazard due to escaping oil The oil from the heat exchanger must not enter the environment. Any oil that has escaped must be disposed of in accordance with the local regulations.

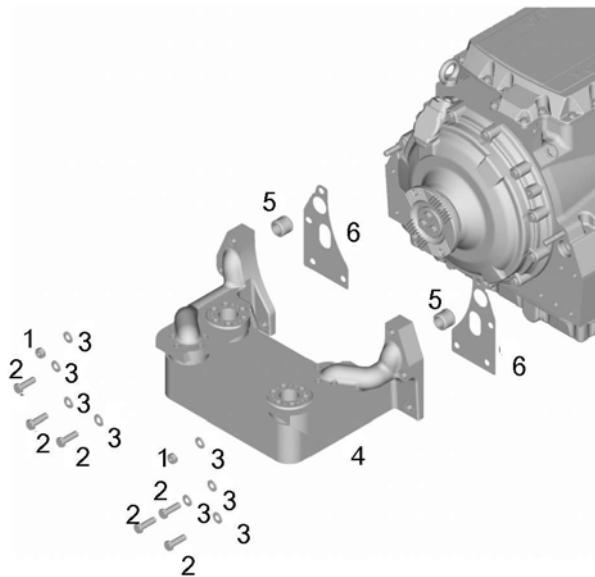


Fig. 12

- ➔ Loosen and remove the two hex. head nuts (1).
- ➔ Loosen and remove the six hex. head screws (2).
- ➔ Remove eight washers (3).
- ➔ Remove the heat exchanger with fastener (4).
- ➔ Pull out the two plug-in tubes (5).
- ➔ Remove the two gaskets (6).

8.2 Removing the control block cover

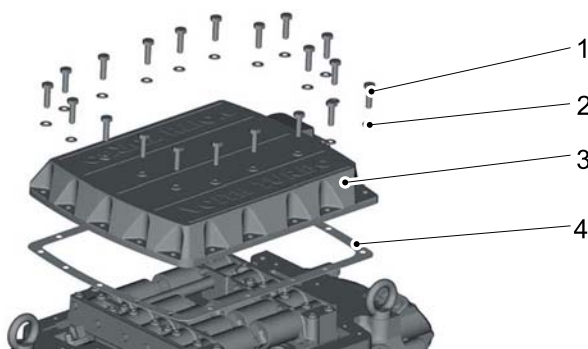


Fig. 13

- ➔ Loosen 20 screws (1) and remove them with their washers (2).
- ➔ Remove cover (3).
- ➔ Remove the gasket (4).

8.3 Removing the Control Blocks

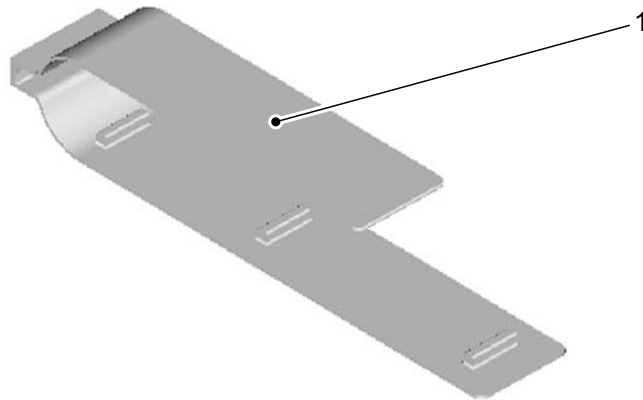


Fig. 14

➔ Remove the protective cover for cables (1).



Fig. 15

1 Cable plug

3 Tool

2 Cables

➔ Pull off cable plug (1) from the solenoid coils.

❑ Special tool [⇒ Page 8] .

	 CAUTION
	The connection between plug and cable can be damaged. When removing the cable plug (1), the connection between cable (2) and cable plug (1) can be damaged. ➔ Use the special tool (3) to remove the cable plug (1) from the solenoid coils. ➔ Never tug at the cables (2).

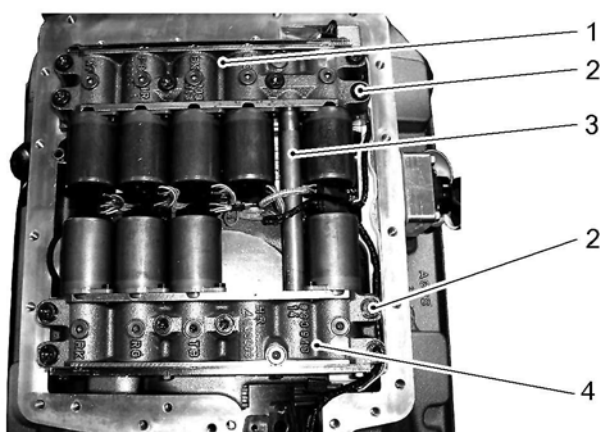


Fig. 16

- | | |
|-----------------------------------|------------------------------------|
| 1 Control block at the input side | 3 Connecting tube |
| 2 Screw M8 | 4 Control block on the output side |

- ➔ Loosen and remove 12 cheese-head screws M8x50 (2).
- ➔ Remove the spring washers 8 (12x) beneath.
- ➔ Take off control blocks (1) and (4).
- ➔ Pull out the connecting tube (3).

8.4 Dismounting the cable harness

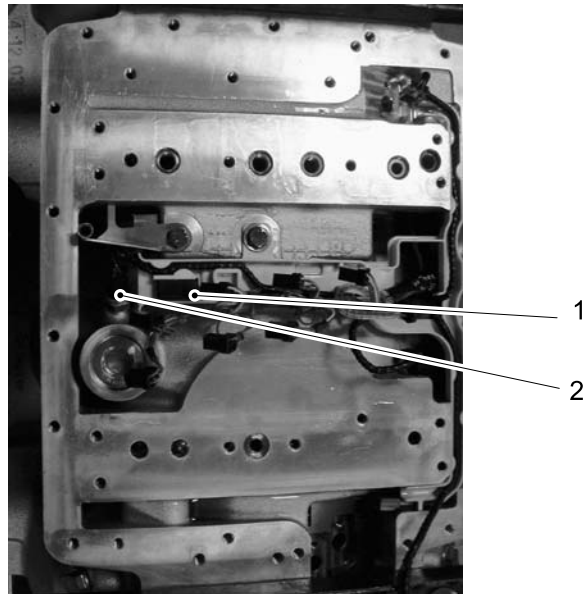


Fig. 17

- ➔ Use special tool (3) [⇒ Page 10] to loosen the plug connection between cable harness and oil sump temperature sensor (1).
- ➔ Loosen the plug connection between cable harness and converter oil temperature sensor (2).

Cable harness with flexible stub cable

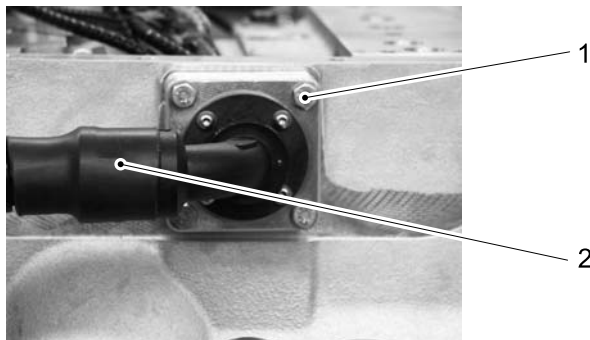


Fig. 18

- ➔ Loosen the four cheese-head screws (1).
- ➔ Pull the cable harness (2) carefully out of the housing.

Cable harness with cable plug attached to housing

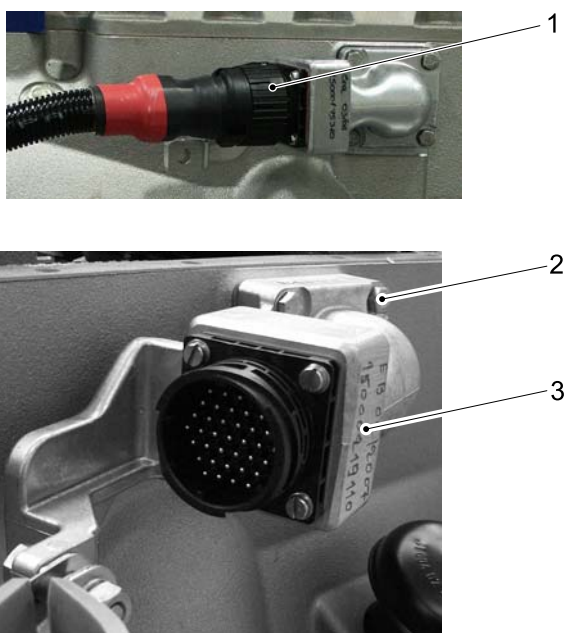


Fig. 19

- ➔ Loosen cable 1 (1) from the cable harness.
- ➔ Loosen the four cheese-head screws (2).
- ➔ Pull the cable harness (3) carefully out of the housing.

8.5 Removing the speed sensors

Position

Speed sensor N1

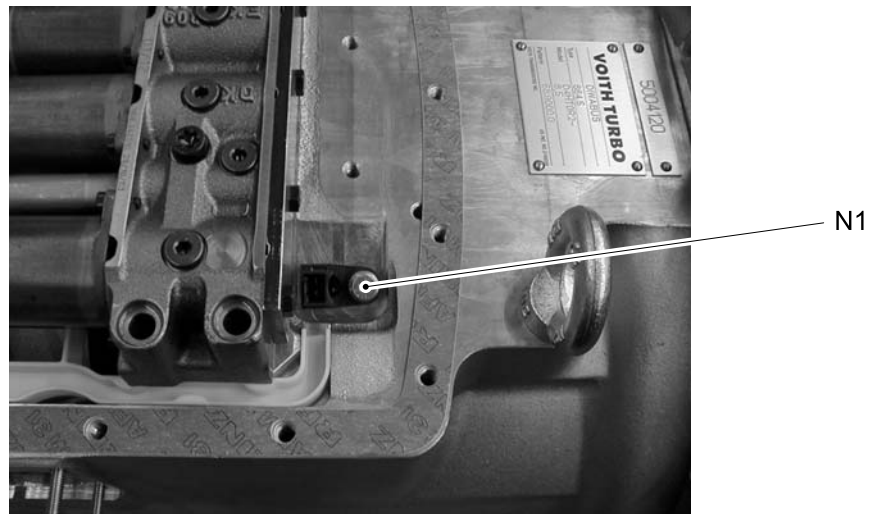


Fig. 20

Speed sensors N2 and N3

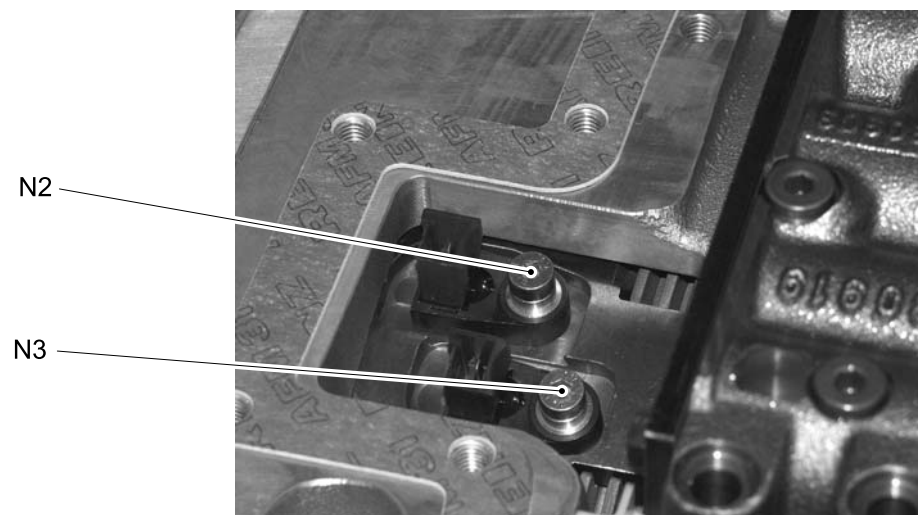


Fig. 21

Dismounting

- ➔ Disconnect the plug connectors of the speed sensors towards the cable harness.

	 CAUTION
	The speed sensor can be damaged. ➔ Never use an impact screwdriver to dismount the speed sensors.

- ➔ Unscrew the screws at the speed sensors.

8.6 Dismounting temperature sensors/oil level sensor

Position

Converter temperature sensor

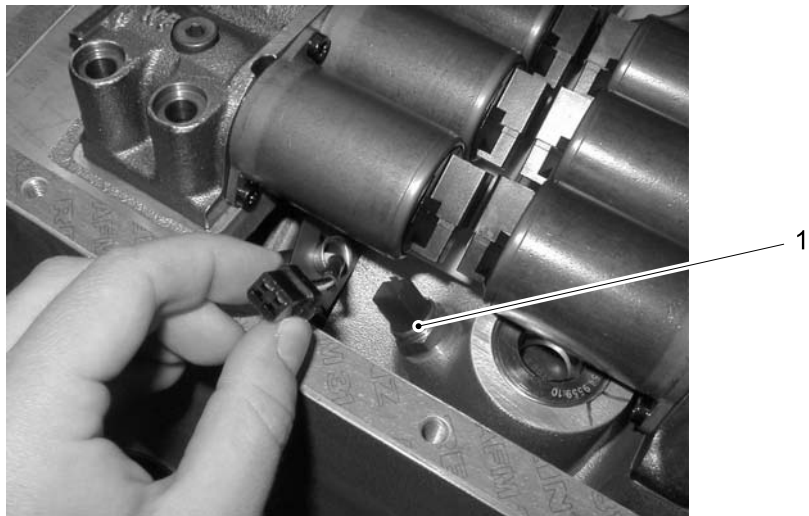


Fig. 22

1 Converter temperature sensor

Temperature sensor / oil level sensor of the oil sump

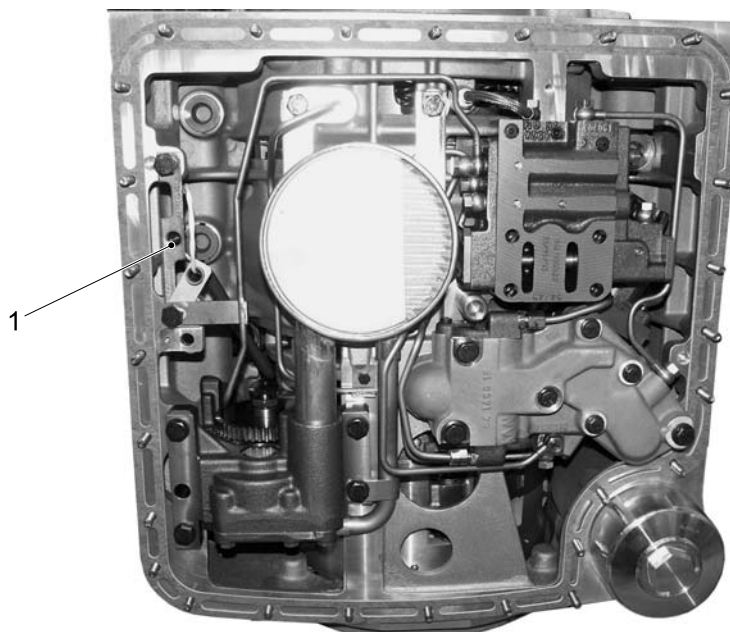


Fig. 23

- 1 Temperature sensor / oil level sensor of the oil sump

Dismounting

Converter temperature sensor

➔ Unscrew the temperature sensor.

Temperature sensor / oil level sensor of the oil sump

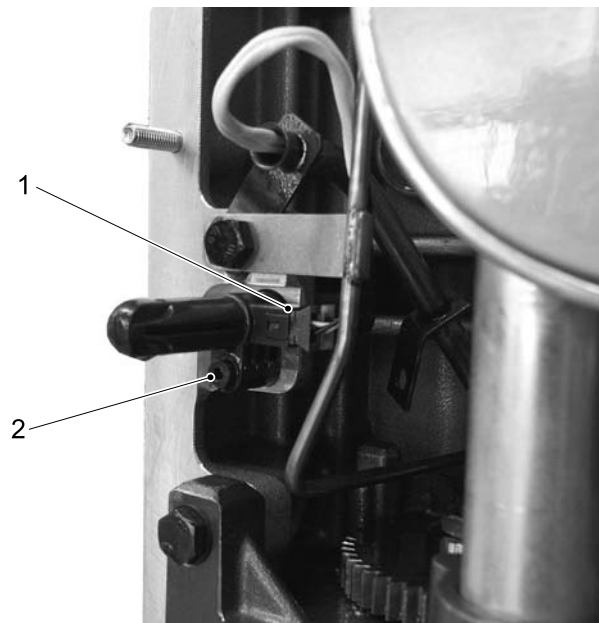


Fig. 24

- ❑ To remove the temperature sensor / oil level sensor of the oil sump, you must first dismount the oil pan [⇒ Page 44] .
- ➔ Loosen the plug connection between temperature sensor / oil level sensor and cable (1).
- ➔ Loosen the screw (2).
- ➔ Dismount the temperature sensors/oil level sensor.

8.7 Dismounting the oil pan

	! WARNING
	The transmission might overturn. Risk of injury and risk of damages to the transmission. ➔ Wear personal protection gear. ➔ Secure the transmission against overturning.

➔ Set up the transmission with the main drive pinion facing upwards.

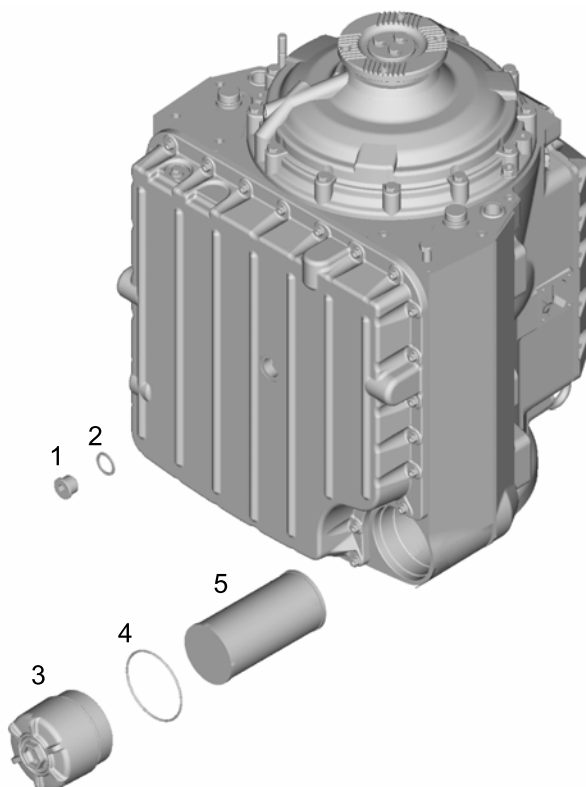


Fig. 25

- ➔ Loosen and remove the oil drain plug (1).
- ➔ Remove the sealing ring (2).
- ➔ Unscrew the oil filter cover (3).
- ➔ Remove the gasket (4).
- ➔ Remove the oil filter (5).

Housing with 28 stud bolts

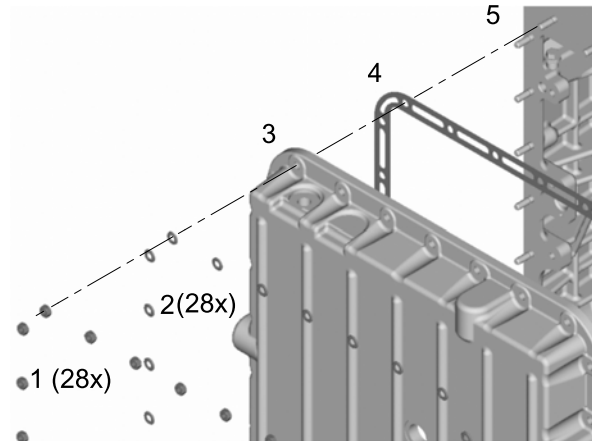


Fig. 26

- ➔ Loosen and remove the 28 hex. head nuts (1).
- ➔ Remove the 28 washers (2).

Housing with 4 stud bolts

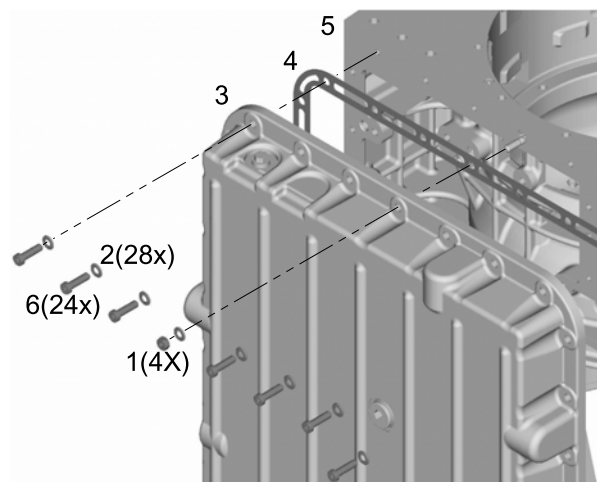


Fig. 27

- ➔ Loosen and remove the 24 hex. head screws (6).
- ➔ Loosen and remove the 4 hex. head nuts (1).
- ➔ Remove the 28 washers (2).

	ENVIRONMENT
	Environmental hazard due to oil. Oil might flow out when removing the oil pan. The oil must not enter the environment and must be disposed of in accordance with the local regulations.

- ➔ Carefully remove the oil pan (3) from the housing (5) by means of the stud bolts.
- ➔ Remove the gasket (4).

9 Dismounting and mounting assemblies

9.1 Dismantle the solenoids

On the input side

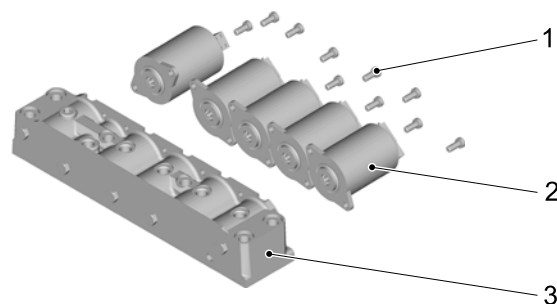


Fig. 28

- ➔ Loosen and remove the 10 hex. head screws (1).
- ➔ Remove the solenoids (2) from the housing (3).

On the output side

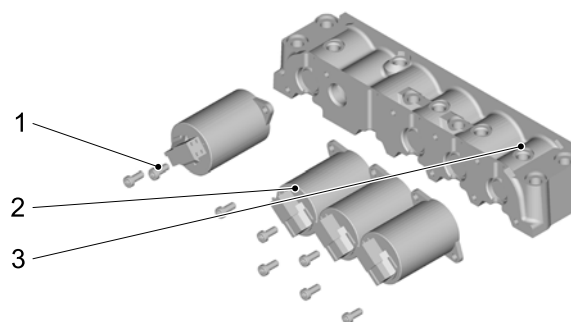


Fig. 29

- ➔ Loosen and remove the 8 hex. head screws (1).
- ➔ Remove the solenoids (2) from the housing (3).

9.2 Installing the solenoids

On the input side

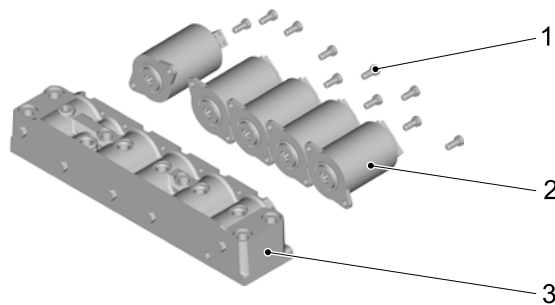


Fig. 30

- ➔ Screw five solenoids (2) to the housing (3) using ten hex-head screws M5x12 (1).
- ❑ Tightening torque 5 Nm
- ❑ The connections for the cable plugs must face upward.

On the output side

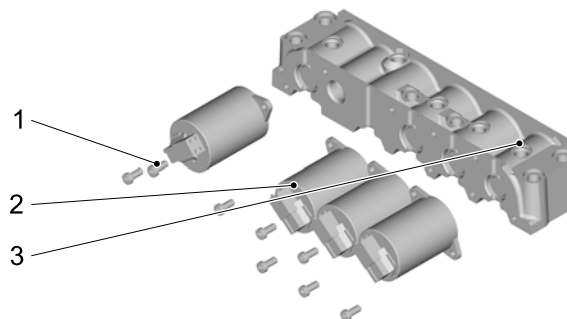


Fig. 31

- ➔ Screw four solenoids (2) to the housing (3) using eight hex-head screws M5x12 (1).
- ❑ Tightening torque 5 Nm
- ❑ The connections for the cable plugs must face upward.

10 Assembling the transmission

10.1 Mount the oil pan.

Housing with 28 stud bolts

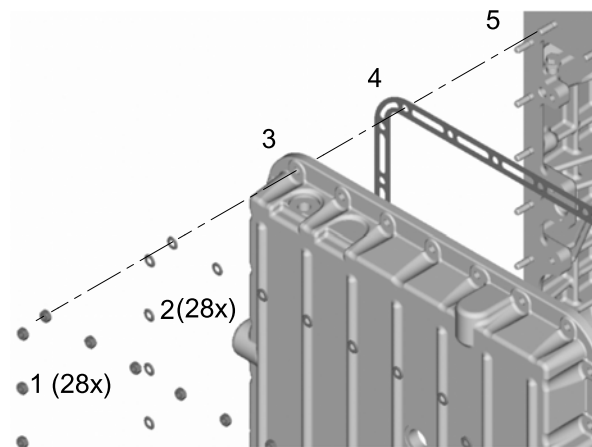


Fig. 32

- ➔ Put on the new gasket (4).
- ❑ The gasket must be free of grease when installing it.
- ➔ Screw the oil pan (3) tight using 28 hex. head nuts (1) and 28 washers (2).
- ❑ Tightening torque 23 Nm.

Housing with 4 stud bolts

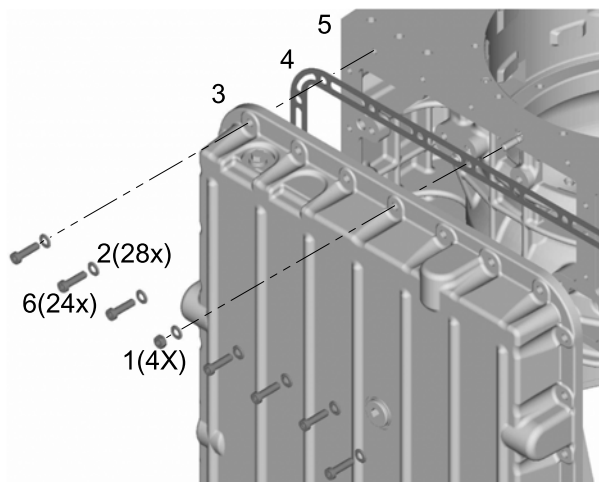


Fig. 33

- ➔ Put on the new gasket (4).
- ❑ The gasket must be free of grease when installing it.
- ➔ Screw the oil pan (3) tight using 4 hex. head nuts (1) and 4 washers (2).
- ➔ Screw the oil pan (3) tight using 24 hex. head screws (6) and 24 washers (2).
- ❑ Tightening torque 23 Nm.

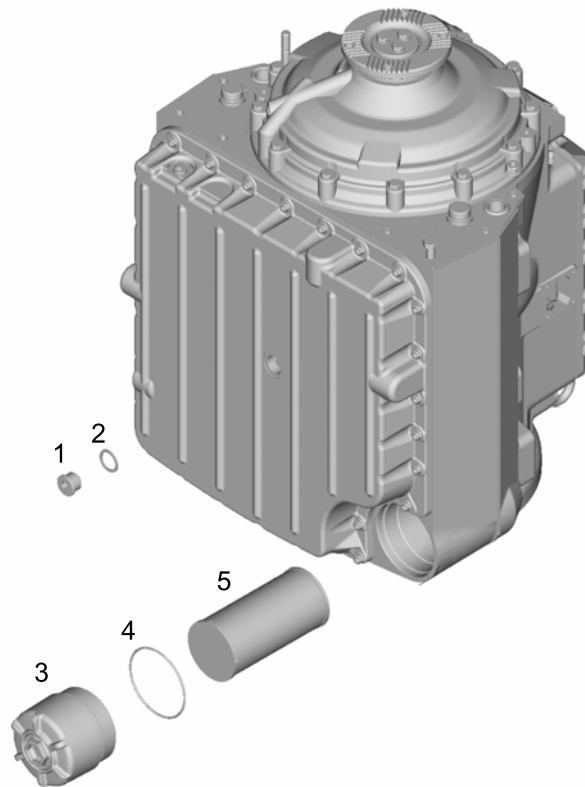


Fig. 34

- ➔ Insert the oil filter (5).
- ➔ Screw in the oil filter cover (3) with new gasket (4).
- ❑ Tightening torque 25 Nm.
- ➔ Screw in the oil drain plug (1) with a new sealing ring (2) A26x34.
- ❑ Tightening torque 100 Nm.
- ❑ Position of the temperature sensors [⇒ Page 41]
- ➔ Insert the new temperature sensors.
- ➔ Tighten the temperature sensors.
- ❑ Tightening torque 20 Nm.
- ➔ Fasten the plug connector of the temperature sensors to the cable harness.
- ❑ Special tool [⇒ Page 10] .
- ❑ Position of the speed sensors [⇒ Page 39]



NOTE

Spacing washers

For N1 and N2, spacing washers are available for setting the distance between the speed sensor and the rotary sensor. The distance must be between 0.8 and 2.5 mm.

→ Use installed spacing washers again.

→ Insert the new speed sensors.



CAUTION

The speed sensor can be damaged.

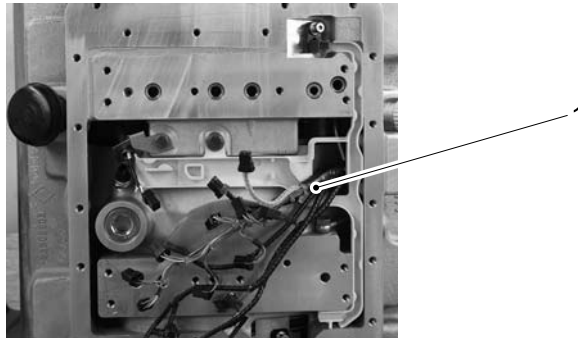
→ Never use an impact screwdriver to assemble the speed sensors.

→ Tighten the screws at the speed sensors.

□ Tightening torque 9 Nm.

→ Fasten the plug connectors of the speed sensors towards the cable harness.

10.2 Mounting the cable harness



Cable harness with flexible stub cable

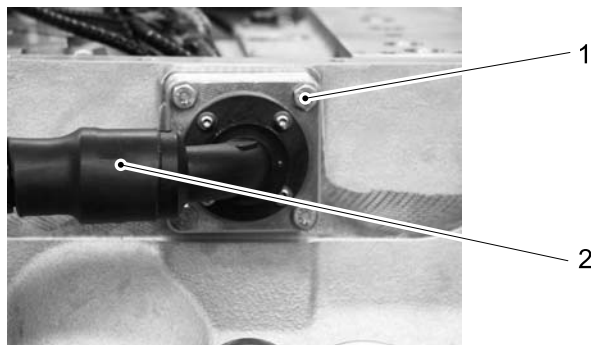


Fig. 35

- ➔ Insert the cable harness (1).
- ➔ Tighten the four hex. head screws M6x40-A4-70 (2).
- Tightening torque 14 Nm.

Cable harness with plug attached to housing

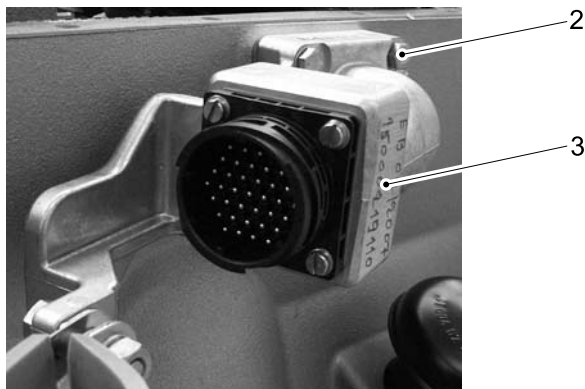


Fig. 36

- ➔ Insert the cable harness (3).
- ➔ Tighten the four hex. head screws M6x35-A4-70 (2).
- ❑ Tightening torque 14 Nm.

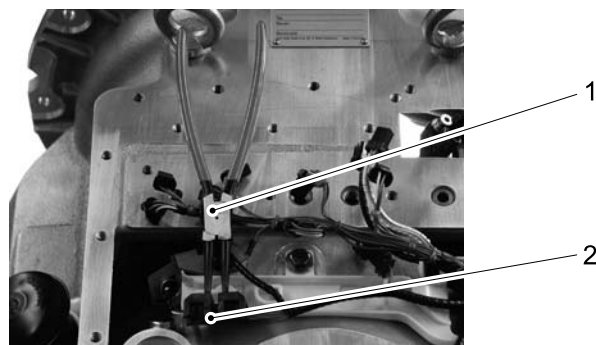


Fig. 37

- ➔ Insert the connector to the oil sump temperature sensor (2) with the special tool (1) [⇒ Page 10] .

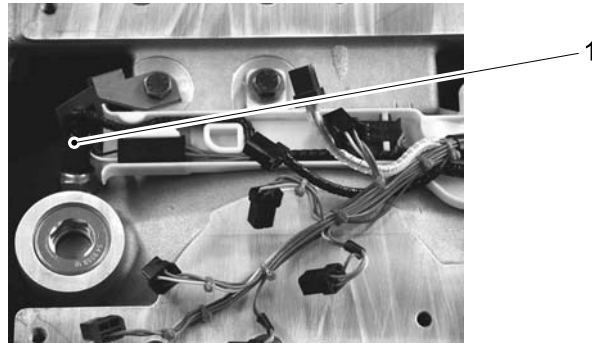


Fig. 38

- ➔ Plug in the connector to the converter temperature sensor (1).
- ➔ Lay the cable and plug in the protective cable covering as shown in the picture.

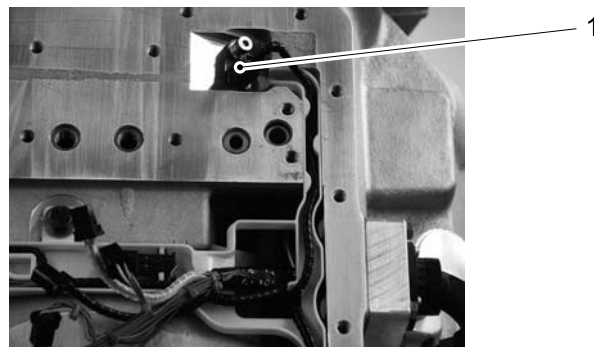


Fig. 39

- ➔ Plug in the connector to the speed sensor N1 (1).

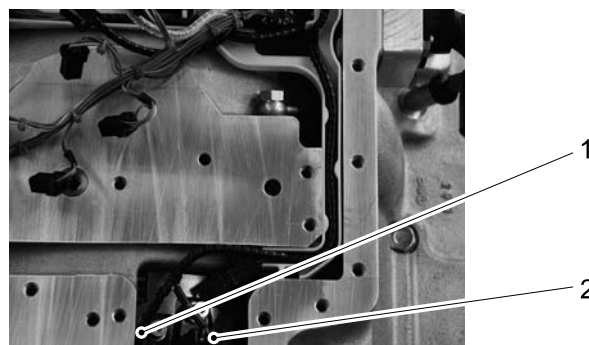


Fig. 40

- ➔ Insert the plugs to the speed sensors N2(1) and N3 (2).

10.3 Mounting the control blocks

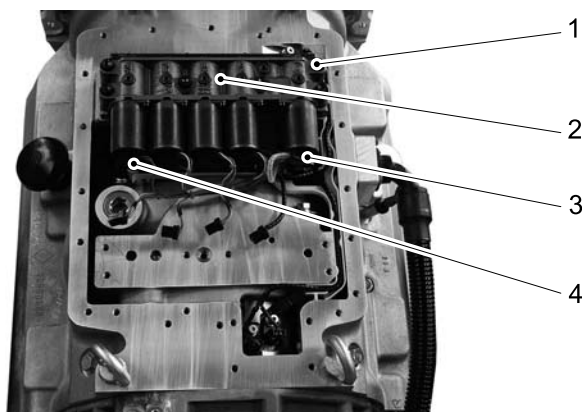


Fig. 41

- ➔ Fasten the control block (2) with six cheese-head screws M8x50 (1).
- ➔ Insert the five cable connectors (4) with the special tool [⇒ Page 9] at the solenoid coils.

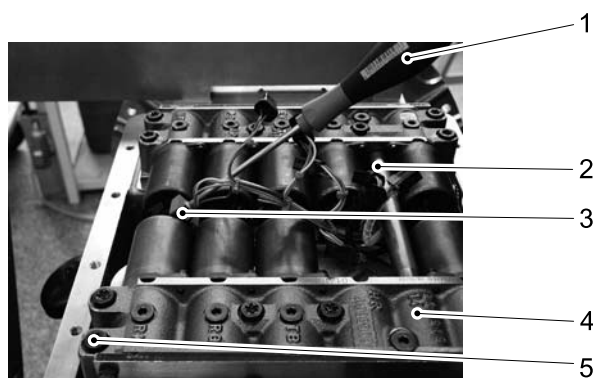


Fig. 42

- ➔ Insert the cable connectors (3) with the special tool (1) [⇒ Page 9] at the solenoid coils.
- ➔ Mount the connecting tube (2) with the new O-rings 12x2.
- ➔ Fasten the control block (4) with six cheese-head screws M8x50 (5).
- ➔ Tighten the 12 cheese-head screws M8x50.
- ❑ Tightening torque 20 Nm.

10.4 Mounting the control block cover

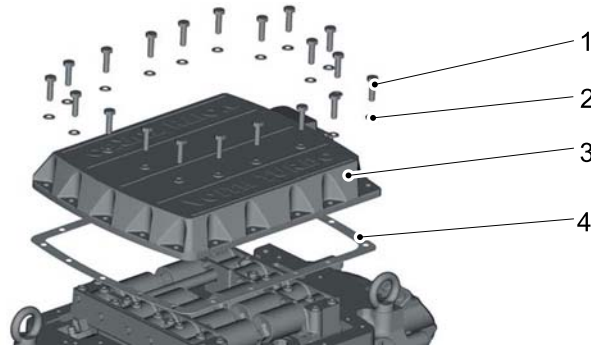


Fig. 43

- ➔ Insert new gasket (4).
- ❑ The gasket must be free of grease when installing it.
- ➔ Screw the control block cover (3) tight using 20 hex. head screws M8x30–8.8 (1) and washers B8.4 (2).
- ❑ Tightening torque 23 Nm.

10.5 Mounting the heat exchanger

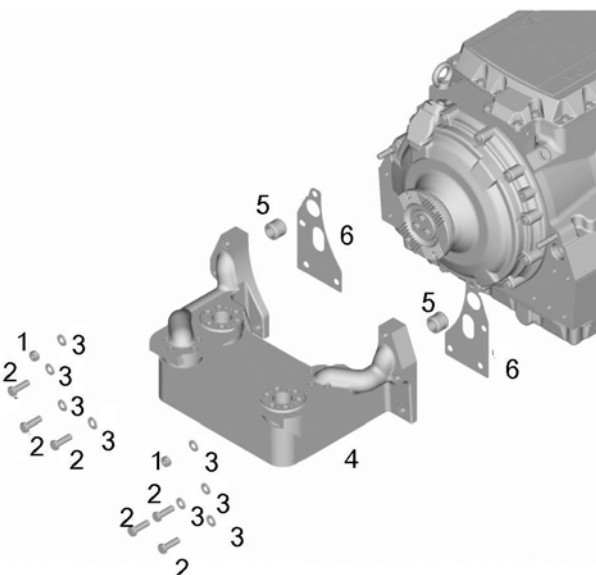


Fig. 44

- ➔ Install two plug-in tubes (5).
- ➔ Put on two new gaskets (6).
- ❑ The gaskets must be free of grease when installing them.
- ➔ Attach the heat exchanger with fastener (4) to the transmission using six hex. head screws M12x40-8.8 (2) and six washers (3).
- ❑ Tightening torque 78 Nm.
- ➔ Attach the heat exchanger with fastener (4) to the transmission using two hex. head screws M12 (1) and two washers (3).
- ❑ Tightening torque 78 Nm.

11 Installing the transmission

11.1 Mounting the hydrodamp

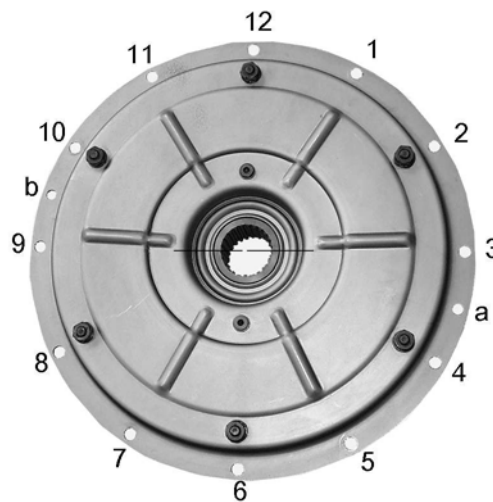


Fig. 45

- ➔ Apply molybdenum disulphide (paste or spray) to the spline profile of the hydrodamp.
- ➔ Fix the hydrodamp at the external pitch circle at the engine flywheel in the positions 2 and 10 o' clock by way of two assembly pins.
- ➔ Push the hydrodamp into the centering.
- ➔ Screw the hydrodamp to the engine flywheel with two screws.
- ➔ Unscrew the assembly pins.
- ➔ Insert the remaining screws.
- ➔ Evenly tighten the 12 screws M10-8.8 crosswise.
- ➔ Tightening torque 46 Nm.

The hydrodamp can also be fixed in the positions a and b at the engine flywheel using two dowel pins.

11.2 Install the transmission

Transmission

- ➔ Apply molybdenum disulphide (paste or spray) to the gear teeth of the transmission input shaft.
- ➔ Move transmission up to the engine.
- ❑ The flywheel housing must be parallel to the transmission flange on the input side.
- ➔ If transmission input shaft and hydrodamp hub are aligned tooth-on-tooth, turn the transmission input shaft until the gear teeth are engaged properly.
- ➔ Move transmission input shaft into the hydrodamp.

	 CAUTION
	Damages at the hydrodamp The hydrodamp can be damaged if the transmission input shaft is inserted improperly into the hydrodamp. ➔ When inserting the shaft, make sure that the shaft is not tilted.

- ➔ Move the transmission up to the hydrodamp until the transmission flange on the input side rests against the flywheel housing.
- ➔ Screw the input-side transmission flange to the flywheel housing.
- ❑ Tightening torque 46 Nm.

Drive shaft

- ➔ Install drive shaft and screw it tight.
- ❑ The installation instructions and safety notes from the manufacturer of the vehicle or the drive shaft must be observed.

	 CAUTION
	Transmission damages due to improper installation of the drive shaft If the two parts of the drive shaft are installed incorrectly, irregular rotations can occur as a result causing critical torsional vibrations especially at high speeds. ➔ When installing the two parts of the drive shaft, make sure that they are aligned correctly with each other and observe the markings.

Connections

- ☐ The heat exchanger bears markings that indicate how to make the connections.
 - water out
 - oil in
 - oil out
 - water in
- ➔ Mount the water pipes.



Fig. 46

- ➔ Make the electrical connections such as:
 - Speedometer
 - Oscillator
 - Cable 1

	CAUTION Contacts The cable harness and cable 1 come with either gold-plated or tin-plated contacts (see customer service letter 173a). ➔ Plug only gold-plated on gold-plated contacts. Plug only tin-plated on tin-plated contacts. ☐ The contacts will be destroyed when linking contacts of different material.
---	---

- ☐ All cable connections must be latched properly and fastened tightly.
- ➔ Fill in cooling water until the max. marking.
- ➔ Fill the transmission with oil.

12 Fill the transmission with oil.

	 CAUTION
	Transmission damages due to incorrect oil level Too little oil can lead to transmission malfunctioning and damages (disk damage). Too much oil can cause the fuel consumption to increase and oil to escape at the breather. ➔ It is imperative to check the transmission oil level before first starting the engine after the transmission has been installed.

➔ Fill ATF oil into transmission

❑ The oil filling orifice can be located to the side of or on top the transmission.

Oil quantity

- For an oil change: ca. 22 l
- For complete refill, e.g. after transmission repair: ca. 24-25 l
- No additional oil filling required for ex-works oil filling
- If the oil level reaches below the min. mark of the oil dipstick, proceed as follows:
The oil level must reach between the marks "min." and "max." of the oil dipstick.

Oil quality

Fill only such oil types into the transmission that are approved in the most recent version of the Voith lubricants lists H55.6335.. and H55.6336..

➔ Check the oil level after filling in the oil and examine the transmission for leaks.

13 Test drive

Preparation

	NOTE Vehicle configuration Depending on the vehicle configuration, different components are installed or different transmission functions are implemented. ➔ For this purpose, please read the vehicle's circuit diagram.
---	---

- ➔ Connect the computer running the ALADIN diagnostic software to the transmission control unit.
- ➔ Reading out the identification data of the control unit:
 - Current software version,
 - Current dataset

Test the safety functions against inadvertent driving.

- ➔ Press one of the forward keys: "1", "2", "3" or "D".
- ➔ Start the engine.
 - ⚡ The engine must **not** start.
- ➔ Apply the reverse gear key "R".
- ➔ Start the engine.
 - ❑ The engine must **not** start.
- ➔ Press the neutral key "N".
- ➔ Step on the brake pedal.
- ➔ Start the engine.
 - ⚡ The engine starts.
- ➔ Press one of the gear buttons.
- ⚡ Vehicle starts to drive.

During the test drive

- ➔ Check the transmission functions, e.g.:
 - All upshifts and downshifts.
 - Function of the converter brake (using the vehicle or transmission diagnostics).
 - Driving in reverse
 - ANS function
 - Check the shifting quality of the transmission at partial and full load.
 - Check the safety functions implemented in the vehicle according to its configuration, e.g.:
 - Gear acceptance with the vehicle stationary only when the brake pedal is depressed,
 - Gear acceptance only up to the engine limit speed.
- ➔ Read out the event memory.
- ➔ Clear the event memory after the faults have been eliminated.

After the test drive

- ➔ Check the transmission for leaks.
- ➔ Check the cooling water connections for leaks.
- ➔ Check [⇒ Page 63] the oil level.

14 Measurement and Test

14.1 Measuring the stall point

- ➔ Apply the parking brake.
- ➔ Start the engine.
- ☐ The engine must have operating temperature.
- ➔ Press one of the following keys: "1", "2", "3" or "D".
- ↩ A forward gear is engaged
- ➔ Depress accelerator pedal to full load and let engine run at full speed for max. 15 seconds.

	 WARNING
	Stall point If the vehicle is operated at the stall point for more than 20 seconds, the transmission might be destroyed. ➔ Never operate the vehicle at the stall point for more than 20 seconds.

	NOTE
	Engine run-up time Satisfactory engine run-up times are between 5 and 8 s. A run-up time of more than 10 s implies bad engine run-up. ➔ In such cases, consult the vehicle or engine manufacturer.

- ➔ Determine the maximum achievable engine speed n_1 (= stall speed) by means of PC diagnosis.

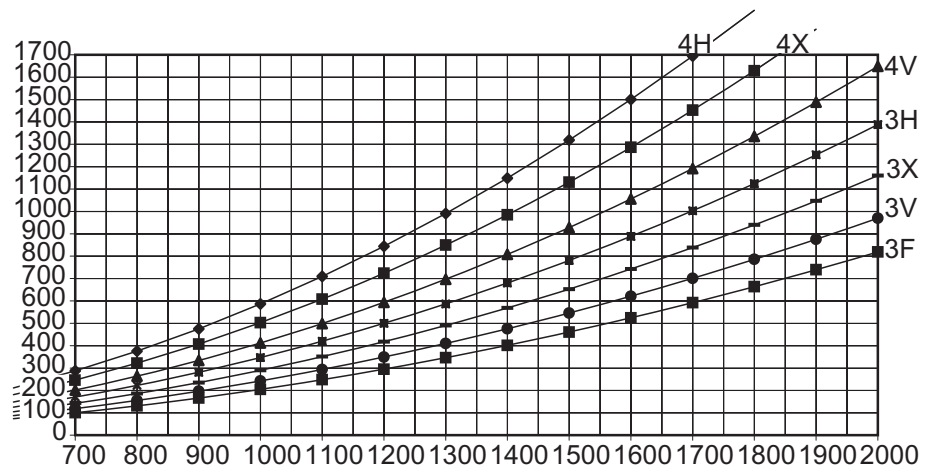


Fig. 47 Pump characteristic diagram (to the right: engine speed n_1 [1/min]; upwards: engine torque M [Nm]).

- ➔ Determine the differential used in the transmission and the pump version by means of the rating plate.
- ❑ The possible combinations of differential and pump range from "4H" to "3F".
- ➔ Enter the measured maximum engine speed n_1 in the pump characteristic diagram.
- ↗ Read off the maximum possible engine torque at bus standstill from the pump characteristic diagram.
- ➔ Check whether the determined engine torque complies with the specifications made by the vehicle manufacturer.



NOTE

Engine torque at vehicle standstill

The torque of the stationary vehicle can significantly deviate from the maximum engine torque while driving since the electronic engine control at stop may limit the engine output to a certain value.

- ➔ Consult the vehicle manufacturer.

If the determined engine torque is **higher** than the value indicated by the manufacturer:

- ➔ Check converter pressure [⇒ Page 68] .

If the determined engine torque is **lower** than the value indicated by the manufacturer:

- ➔ Consult the vehicle or engine manufacturer.

14.2 Measuring pressures

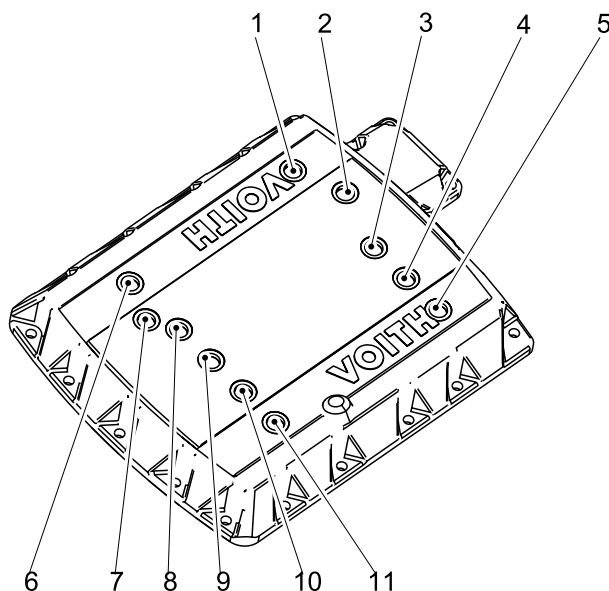


Fig. 48 Measuring cover

- | | |
|----------------------|----------------------|
| 1 WR | 7 Operating pressure |
| 2 Converter pressure | 8 DK |
| 3 TB | 9 EK |
| 4 RG | 10 PB |
| 5 RK | 11 WP |
| 6 SK | |



DANGER

Risk of burning through hot oil

Improper behaviour may result in severe injuries or scalding.

- ➔ Mount the measuring cover only with the engine dead.
- ➔ Connect the pressure gauge only with the engine dead.

Operating pressure

- ➔ Measure the operating pressure at measuring point 7 (see illustration).
- after shifting into second gear,
- at an engine speed of approx. 1500 1/min,
- at an oil temperature of 80-90 °C.
- ❑ The setpoint for the operating pressure is $p_A = 8.5 \text{ bar}$. ($\pm 0.2 \text{ bar}$).
- ❑ If the operating pressure deviates from this value, it has to be re-adjusted. The operating pressure may, for instance, deviate from the setpoint after disassembling and assembling the operating pressure valve.
- ❑ The adjustment bore in the housing allows the threaded pin with hexagon socket at the operating pressure valve to be turned using a hexagon socket wrench a/f 5. The threaded pin allows adjusting the preload of the spring in the operating pressure valve.

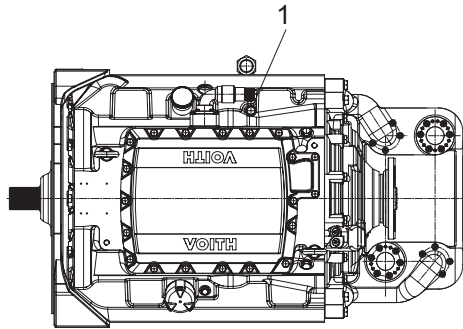


Fig. 49 1 - Adjustment bore

- ➔ Turn the threaded pin until an operating pressure of 8.5 bar is reached.

If the operating pressure is below the setpoint and can no longer be set to 8.5 bar, the gear pump could be defective.

- ➔ Check the gear pump, replace it if necessary (see repair manual).
- ❑ The setpoint at engine idle speed (500 $\pm$ 50 1/min) is $p_A \geq 3.5 \text{ bar}$.
- ➔ See the illustration for measuring points.

Pressures at the solenoid valves

At the measuring points DK, EK, PB, WP and SK, the pressures must be identical to the operating pressure.

	NOTE WR pressure The WR oil pressure is cycled and therefore variable over time. Its height depends on the operating status (braking or reversing). Therefore, simple pressure measurements by means of a pressure gauge are not suitable for more thorough troubleshooting at the WR valve.
---	--

	NOTE Exception for RBK pressure The RBK pressure for braking in first gear is 1 bar. In few cases the RBK pressure for braking in first gear is max. 2 bar.
---	--

Converter pressure

➔ Measure the converter pressure at measuring point 2.

- ☐ $p_c \geq 2 \text{ bar}$ at
 - oil temperature t_{oil} 80-90 °C
 - with forward gear engaged,
 - engine at idle speed (500 ± 50 1/min),
 - and parking brake applied.

See the illustration for measuring points.

If this value is not reached, the converter sealing must be improved.

➔ Please contact the Voith customer service in this matter.

- ☐ p_w when converter filling control (CFC) $p_c = 0 \text{ bar}$ is active.

15 Tightening torques

Tightening torques for hex. head and cheese-head screws

Dimensions	Property class	Tightening torque [Nm]	Tightening torque [lb-ft]
M4	8.8	3	2
M4	10.9	4	3
M5	8.8	5	4
M5	10.9	8	6
M6	8.8	9	7
M6	10.9	14	10
M8	8.8	23	17
M8	10.9	33	24
M10	8.8	46	34
M10	10.9	67	49
M10x1	8.8	51	38
M10x1	10.9	75	55
M12	8.8	78	57
M12	10.9	115	85
M14x1.5	12.9	232	171
M16	10.9	281	208

Special cases

Name	Dimensions	Tightening torque [Nm]	Tightening torque [lb-ft]
Control block	M8x50	20	15
Output flange	M10x50-10.9 SBE	72	53
	M10x50-10.9 SBE-R	66	49
Oil filter cover	S110x3	25	18
Temperature sensor	M14x1.5	20-25	15-19
Adapter screwing at the oil sump	1.5/16-12 UNF	50	37
Screw plug at the oil sump			

Tightening torques for screw plugs and hollow screws with CU sealing rings

Dimension s	Sealing ring	Tightening torque [Nm]		Assembly		Name
		Steel/Al		oiled	dry	
M10x1.5	10x13.5	13	10		M10x1.5	10x13.5
M10x1	10x13.5	15	11		M10x1	10x13.5
M12x1.5	12x15.5	20	15		M12x1.5	12x15.5
M14x1.5	14x18	38	28		M14x1.5	14x18
M18x1.5	18x22	45	33		M18x1.5	18x22
M26x1.5*	26x34	100	74	x	M26x1.5*	26x34
M30x1.5*	30x36	115	85	x	M30x1.5*	30x36
M32x1.5*	32x38	130	96	x	M32x1.5*	32x38
M38x1.5*	38x44	150	111	x	M38x1.5*	38x44
M42x1.5*	42x49	190	141	x	M42x1.5*	42x49
M48x1.5*	48x55	260	192	x	M48x1.5*	48x55


NOTE

Sealing ring and screw of dimensions marked with * have to be oiled slightly.

All other sealing rings and screws have to be mounted dry.

Voith Turbo GmbH & Co. KG

Alexanderstrasse 2

D-89522 Heidenheim

+49 7321 37 0

+49 7321 37 7618

service-diwa@voith.com

www.voithturbo.com

VOITH
Engineered reliability.